Space Weather Forecast

Issued on Saturday, 04 February 2023 at 12:44 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of Minor Geomagnetic Storm G1 peaking into the new week. Probable increase in X-ray flare activity through period from arriving sunspots.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low over the past 24 hours, with X-ray activity limited to occasional minor Common-class flares in the past 24 hours. These flares peaked in magnitude at 03/1646UTC from a sunspot region in the southeast. This was one of up to five sunspot regions on the Sun. All the surviving magnetically bipolar spots on the Sun showed slow proliferating and spreading tendencies, but were otherwise unremarkable.

Although not registering as the peak flare of the period, also of note was a long-period Common-class event seen from the southeast at 04/0053UTC, with this associated with a 'filament lift off' (arc of plasma leaving the Sun) that is now likely becoming visible in satellite imagery as mainly orientated east of the Sun-Earth line. Another possible event of note was a 'filament channel'-like signature on some extreme UV imagery (the footprint of a filament lift off) in the northwest through the early hours (UTC) of Saturday 04 February, with this also apparently materialising on interplanetary satellite imagery.

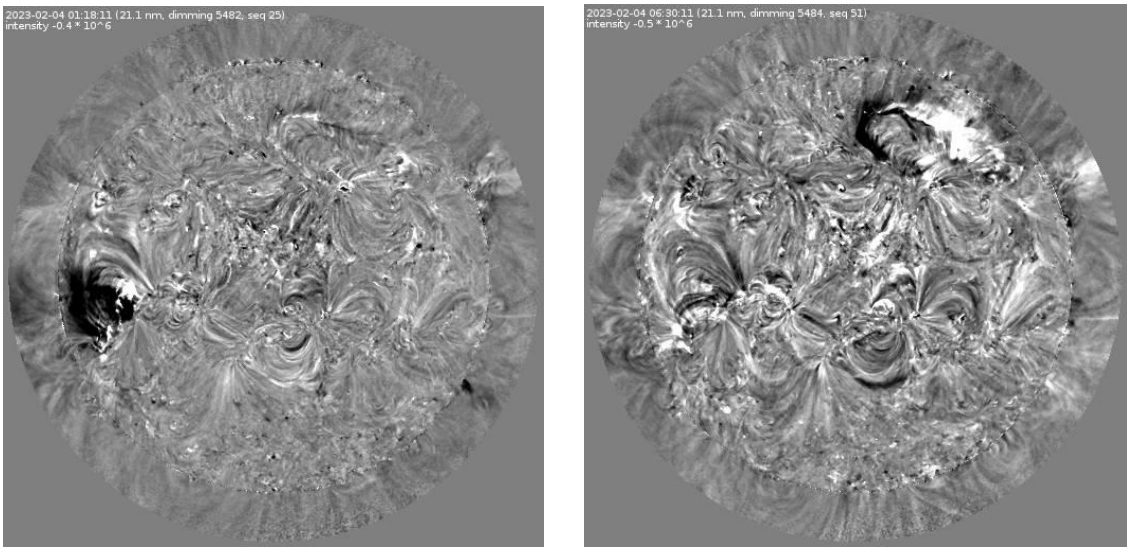

Figure 1: Time-integrated extreme UV imagery of two noteworthy events in the past 24 hours: firstly (left) a 'filament eruption' was observed from the southeast around 04/0100UTC. Secondly, right, a 'filament channel'-like footprint was seen in the wake of activity in the northwest of the Sun around 04/0600UTC. Both of these events appear to be associated with CMEs, with these undergoing analysis at present.

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Available imagery is currently congested with many apparently peripheral Coronal Mass Ejections (CMEs) and is being pored through for those that may be Earth-directed, although there are no obvious candidates. At present then, tentatively there are no Earth-directed CMEs confirmed in available imagery.

Solar Wind / Geomagnetic Activity: Solar wind parameters were indicative of an overall slow wind regime, but with probable influence from a weak CME onset prior to this 24-hour window, from 03/1050UTC. There was also a minor discontinuity evident in many measures at 03/1800UTC. This discontinuity was near-concurrent at a satellite sampling the solar wind around a day in advance of Earth (seen at 03/2000UTC). This perhaps implies that this jump was also CME related, albeit not impactful in terms of geomagnetism, and in any case perhaps related to the earlier arrival (i.e. not a novel feature).

Solar wind speeds were within normal background range in spite of possible CME influence, and the number of particles comprising the wind was mostly within its typical range, with a slight decline seen. The magnetic field associated with these particles was Slightly Elevated, peaking prior to a lowering with the 03/1800UTC discontinuity, while the north-south component varied approximately sinusoidally between being co-aligned and anti-aligned with Earth in a CME-like behaviour.

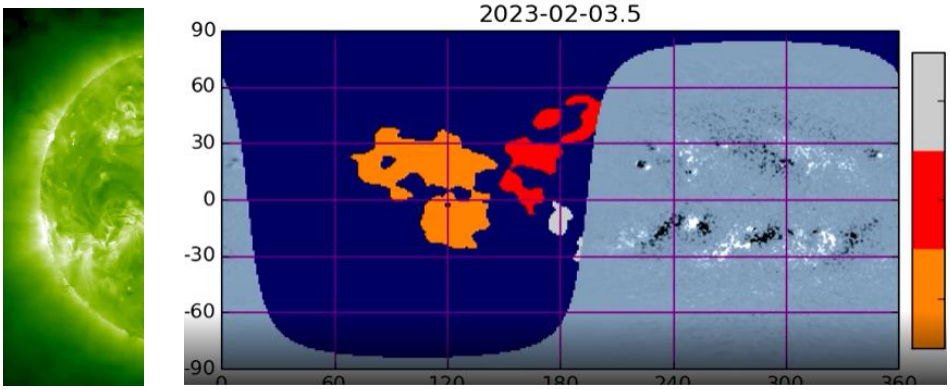
The net effect of the above solar wind measures was for mostly quiet geomagnetic activity, with a provisional peak below Minor Storm G1 recorded in the 15-18UTC interval.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Mainly low solar activity is expected at first, however there are signs that the arriving eastern solar horizon contains more potent active regions (from CME evidence, 'prominences' (arcs of plasma on the Sun's edge) and imagery), with a probable increase in activity therefore mooted for the coming UTC working week. This being said, until any regions show, the current slight chance of Moderate-class activity is held constant given the largely quiet current Earth-facing side.

Figure 2: False-colour extreme UV imagery (left) showing possible sunspot regions around a day aahead of them becoming visible from an Earth perspective (as of 04/1145UTC). Also shown is a far-side sounding (right) showing possible upcoming regions on the far-sided eastern solar hemisphere (the dark blue field with bright possible sunspot region-containing areas - note that their size is often over-represented in this imagery).



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Solar Wind / Geomagnetic Activity: No CMEs feature in the forecast at present, however note that there are some (most likely peripheral) unassessed events at the time of writing.

A slow regime and quiet conditions should predominate at first. Uncertainty surrounding the arrival (and now polarity) of the fast wind from a coronal hole leads to reduced confidence for much of the remainder of the period, although an upstream satellite implies any fast wind is at least a day away. Elevated wind speeds are most likely from this feature, with arrival possible from later Day 2 (Sunday 05 February).

Geomagnetic activity is expected to be mainly quiet at first, but with a chance of a G1/Minor Storm interval from later day 2 (Sunday 05 February) and possibly Day 3 as the anticipated fast wind arrives.

Energetic Particles / Solar Radiation: No solar radiation storms are expected.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	20	25	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	10	10	10	10
Very Active	R3 to R5 X	No	1	1	1	1

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Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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